The Pepper Wreck, and Early 17th Century Shipwreck in the India Route



Thursday, May 14, 10:00 to 11:30

Filipe Vieira de Castro





The voyage was long and dangerous.





<u>Apollo 11 (1969)</u>:

Take off Moon landing Moon walking Take off from Moon Sea landing 16 July, 13:32 (Greenwich) 20 July, 20:17 21 July, 02:56-05:07 21 July 17:54 24 July 16:51



The technology required to make to India and back was not trivial



Lisbon was a sophisticated city, with enough knowhow to deploy its power in the Indian and Pacific Oceans.



Lisbon was a laboratory where solutions were constantly found for the problems posed by its global commercial strategy.

The ships



The Iberian ships of the 16th century were among the best in the world



...and some of the fastest and better armed



Braun and Hogenberg, 1598

An account of an expedition under the Earl of Essex against the Western Islands

Whilest we thus stayed about the Rocke, ye carvalls of Lyshbourne and of the parts thereabouts would daylie come swarminge about us like butterflies soe neare us as that we might cast a stone into some of them, and yet could we never catch any one of them, soe warie and nimble they are.

Sir Arthur Gorges CSP DOM Conway Papers 1604, xxxvi No 94. Addendum 1580-1625

Shipbuilding

We don't know much about these ships



Caminha, 1509 Duarte d'Armas

Shipbuilding books and treatises appear one century after Bartolomeu Dias, Columbus, and Vasco da Gama.

acertante as demais coor bracos, parg of dentes; quas afinalator nelles eshar offor heras. Gevons of Conador nos mos casuroras, og Endo representa cota figura na gual GAH he a cami na merka, CI, un braco e FK, outro, cufos couados onde se a funtas sas L, e M, As primeiras Aporbing



Sas. JO, CN. acertadas nos dentes J. e C. Cespaco. CD. The deponta de un braco a outra do outro braco. Se macica co um fas que igoal co a cauerna a he a entremicha que dible atras. Einto he is de uma face da Cauerna: Contros dous bracos se has de por da outra, quenhis de f à L, e de Cà Usobre as pontas des Aportures, e da Cauerna, e o espaco que pontas des Aportures, e da Cauerna, e o espaco que pontas des Aportures, complimero, se hatambe de macicar to outra lo bemicha; como de todo scarasDescriptions are rare and vague, iconography scarce, inaccurate and often painted from stock images.



Retábulo de Santa Auta, MNAA, Lisbon, c. 1520.



Carracks on a Rocky Coast, NMM, Greenwich, c. 1527 (attributed to Joachim Patinier).

Artists seldom looked at nature...



Franz Huys etching, after Pieter Breughel the Elder, c. 1565.

Escorial, c. 1598

The (very few) 16th century ships that were excavated and **published** give us clues about conception and construction of these amazing machines.



The project



Tiago Santos e Tomás Vacas, IST





Audrey Wells, Texas A&M

A ship is a complex machine and we often lack information about the details.



Audrey Wells, Texas A&M

Timber is a key component: ships consumed a lot of timber and with special characteristics.

A model – a working hypothesis – can be tested and its plausibility improved, through an iterative process. It floats upright? Is it stable? Does it sail within the parameters described in historical sources? Does it carry all the people and cargo described?





None of these questions has simple answers.



Computer graphics are great tools to help test our hypothesis.



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Timber



Cities consumed large quantities of timber (charcoal, house building, etc.).



Forest management is an interesting research subject.



The timber cycle is badly known.

There are few studies of timber used in shipbuilding.



And few studies of labor organization in shipyards.



To chose, fall, clean, transport and store timber is an important research subject.





Purchase, storage and transformation of timbers.

Timber from Praça do Município, Lisboa, the old shipyard.







The estimated weight of the nau *Nossa Senhora dos Mártires, about* 350 tons (Pine sg = 0.47 e Oak sg = 0.64), or more or less 580 m³, corresponding to more or less 830 trees (estimating 0.7 m³ of timber per tree).





Treasure

Hunters











CHRISTIE'S Amsterdam

The Fort San Sebastian Wreck A 16th Century Portuguese Porcelain Wreck off the Island of Mozambique

WEDNESDAY 19 MAY 2004

Most Iberian ships have been destroyed by treasure hunters.
Alleged 1502 remains of one of the ships from Brás and Vicente Sodré in Oman, Curia Muria Islands (today Halaniyat Islands).





Alleged 1502 remains of one of the ships from Brás and Vicente Sodré in Oman, Curia Muria Islands (today Halaniyat Islands).





Ship dated to 1527, "worked" by treasure hunters off Madagascar.



Copper ingots with the Fugger mark.



Hull of a Portuguese ship salvaged in Mozambique.







São Julião da Barra

Expo'98

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São Julião da Barra was a dangerous point.









Pepper Wreck: Nossa Senhora dos Mártires, 1606?

Lots of shipwrecks happened there.





Treasure hunting law, 1993-1995...



Decreto- lei 289/93, de 21 de Agosto.

1996: The Pepper Wreck, N. S. dos Mártires, 1606



Excavation started in 1996, directed by Francisco Alves.









Pepper Wreck









Over 2,000 artifacts dated to circa 1600.















Lost account:

Perdição das naus, e das que se salvaram na barra de Lisboa no anno de 1606.

por D. João Soares de Alarcão (1580-1618)



D. João Soares de Alarcão era filho de D. Martinho Soares de Alarcão, 6.º alcaide de Torres Vedras, e de D. Cecília de Mendonça, filha de Filipe de Aguiar, mestre-sala da Casa Real. Foi comendador da Ordem de Cristo, 7.º alcaide-mor de Torres Vedras, e mestre sala da Casa Real. Casou com D. Isabel de Castro e Vilhena, irmã de D. Jorge Mascarenhas, marquês de Montalvão.



Reconstruction of an India nau

















Pinus pinea

Keel, frames & apron: Cork Oak Hull planking: Stone Pine



Quercus suber



Parallels:

Sto. António, 1589, Seychelles Molasses Reef Shipwreck, c. 1510, Turks and Caicos Orangemund Shipwreck, c. 1530.











16th Century:

- People start publishing treatises;
 - Social status of shipwrights improves (with the price and complexity of ships).









Some treatises are beautiful...





Manoel Fernandez *Livro de Traças de Carpintaria*, 1616

Some treatises have good details...

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João Baptista Lavanha *Livro Primeiro de Arquitectura Naval*, c. 1610

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Some are quite technical...

Fernando Oliveira's *Ars Nautica*, c.1570 & *Liuro da Fábrica das Naus*, c.1580











Côvados.








Fernando Oliveira's nau

Basic measures for the construction of Oliveira's India nau		
Element	Rule of Proportion	Value (m)
A. Keel	18 rumos for 600 tonéis	27.72
B. Spring of the stem post	1/3 of A	9.24
C. Height of the stem post	1/3 of A	9.24
D. Rake of the stern post	1/4 of A/3	2.31
E. Height of the transom	1/3 of A	9.24
F. Maximum breath	1/3 to 1/2 of A	12.32
G. Flat amidships	1/3 to 1/2 of D	4.1
H. Room and space I. Rising of the bottom	1 <i>palmo de goa +</i> 1 <i>palmo de</i> Forward: H: Aft: 1.5 H	0.48
J. Narrowing of the bottom	1/6 of G	0.68
K. Height of the fashion pieces	Start at 1/3 of E	3.08
L. Breath of the transom	1/2 of F	6.16
M. Maximum breath on main deck	F - (» 1+1 palmos de goa)	11.81
N. Depth of the hold	14 palmos de goa	3.59
O. Depth of the second deck	9 palmos de goa	2.31
P. Depth of the gun deck	9 palmos de goa	2.31
Q. Length of the quarter deck	1/2 of length of deck (D+A+B)	20.46
R. Height of the quarter deck	8 palmos de goa	2.05
S. Length of the poop deck	1/2 of Q	13.86
T. Height of the poop deck	7 palmos de goa	1.8
U. Length of the forecastle	1/2 of M	5.9
W. Height of the forecastle	1/3 of M	3.94
V. Height of bulwarks on the deck	1 rumo	1.54
X. Height of bulwarks on the	3 palmos de goa	0.77
Y. Length overall	A+B+D	39.27







I have obtained a displacement of around 1,100 tons for a waterline touching the lower whale amidships.

Interior Space





Luiz de Figueiredo Falcão *O Livro de Toda a Fazenda*, 1607



Rigging

100





Stability































Structure

Contemporary ships from several sources:



Iberian and Mediterranean shipwrecks



Nau from *Livro náutico*

















Alex Hazlett



Alex Hazlett



Alex Hazlett



Tomás Vacas



Life Aboard





Loading



Life Aboard Audrey Wells:









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3D modeling is the best conceivable tool to reconstruct complex structures such as ships.

It is impossible to acquire a clear image of the spaces contained within one of these ship's hulls in abstract, or even only with two-dimensional drawings.

Help

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The process of interpretation of old documents is drastically improved, becoming an iterative process in which the researchers go back to the documents after seeing the range of possibilities of the three-dimensional spaces described and exclude the implausible ones.



These spaces are two complex and the ships under analysis were conceived to be loaded to full capacity.


The size of barrels and sacs can be changed in view of new data.



Details like the placement and operation of a capstan, or a windlass (the *estrinca*), can only be tested in models.





On the return voyage:

450 people: 150 sailors, 50 soldiers, 40 passengers, 200 slaves, 10 priests...



Luca Cambiaso (1527-1585)















Ballast: 175 tons, 113 m³, up to 1.46 m high.



Peppercorns: 172 tons, 345 m³, c. 2.5 m high.



Water and wine: 313 + 115 pipas. Hardtack.



Hardtack: 1289 sacs.





























Sailing



Performance under sail

Nuno Fonseca

IST, SAEN



Performance under sail

Nuno Fonseca

IST, SAEN

Linhas de corrente do escoamento - Vento de través Partida de Lisboa em Março Travessia do Atlântico preferencialmente durante Primavera Velocity (Streamline arch-May18 metre wind m/sec .707e+00 .280e+001 1.534e+000 267e+00 Comparação de velocidades Velocidades da Nau da Índia 8 ----- Volvo 70 ----- Nau 7 6 5 8 9 10 4 Vento (m/s)





Outreach-

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Thank You!